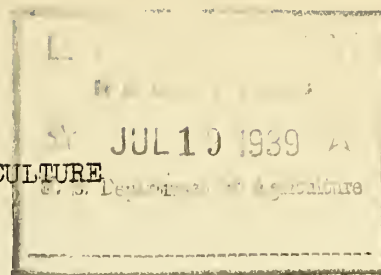


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UNITED STATES DEPARTMENT OF AGRICULTURE  
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CHANGES IN WEIGHT OF STANDARD PACKAGES OF VINIFERA  
GRAPES DURING TRANSIT FROM CALIFORNIA TO EASTERN MARKETS 1/

By

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1/ This investigation was undertaken at the request of the Bureau of Agricultural Economics to obtain authentic information for use in the adjudication of claims under the Perishable Commodities Act.

2/ The writers wish to acknowledge their indebtedness to the following associates: James S. Wiant for handling many of the test shipments in the New York City market; D. H. Rose, E. D. Mallison, and E. A. Gorman, Jr., and receiving point inspectors of the Bureau of Agricultural Economics who assisted in the handling of test shipments in other eastern markets. They also wish to thank the growers, shippers, and receivers whose co-operation made these tests possible.

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## INTRODUCTION

Claims for allowances and price adjustments have arisen from disputes between shippers and receivers concerning the extent of normal shrinkage in weight of standard packages of grapes while in transit from California to eastern markets. This investigation was conducted in 1933 and 1934 to find by actual determinations of weights at the shipping point and terminal market what losses could reasonably be expected to occur in transit.

Initiated as a study of the behavior of two varieties over which particular controversy existed, the inquiry was expanded to include others of importance so that the investigation would be comprehensive enough to apply to vinifera grapes in general.

## METHODS

An attempt was made to include shipments from the principal producing localities at times when shipping was heavy. The fruit used in the tests was probably of better quality than the average table grapes packed in the State. Test lots of fruit were shipped in cars that were billed to fruit auctions in large eastern cities.

### Varieties used:

All of the varieties of vinifera grapes which enter into interstate commerce in large quantities were represented in the work. For the years 1933 and 1934 in which this work was done the varieties moving in the greatest volume were as follows:

California Interstate Shipments of Grapes--Carloads 1/

<u>Variety</u>	<u>1934</u>	<u>1933</u>
Thompson Seedless	4169	3285
Tokay	3792	4024
Emperor	3631	3499
Malaga	2261 <u>2/</u>	1967 <u>2/</u>
Alicante Bouschet	4456	3621
Carignane	2135	1630
Zinfandel	2495	2665
Muscat	1939 <u>3/</u>	3902 <u>3/</u>

1/ Federal State Market News Service Report #160, revised Dec. 14, 1934, U. S. Dept. Agr., Bur. of Agr. Econ. and Calif. State Dept. Agr. cooperating. (Mimeographed)

2/ Does not include 741 carloads of juice Malagas shipped in 1934 or 190 carloads moved in 1933.

3/ There were also 61 cars of table Muscats shipped in 1934 and 32 carloads in 1933.

Selection and handling of test packages:

The fruit in each car under test was packed, loaded, and shipped according to the usual practice of the shipper. All of the juice grapes were field packed, and the Muscats used in 1934 were faced in the packing house before lidding. The table grapes, except the Sultanina (Thompson Seedless) and the Emperors and Malagas used in 1933, were field packed. Whenever possible the intermediate, or average, grade of fruit was taken for the tests. Many houses pack three grades of table grapes,

the intermediate or "second pack" making up the largest portion of the load. Packers preferred that the premium grade should not be used, and frequently the third grade was considerably inferior to average table stock, being practically of juice quality.

Small counter platform scales certified by the county sealer of weights and measures were used to weigh packages of fruit. These were set up in the packing house or inside the car at some place where the weighing and marking could be done without interfering with the packing and loading operations. A key number was marked on the box and the weight was recorded on work sheets that were later sent to the coworker at the eastern market. Weights were recorded to the nearest ounce.

In order that the lugs could be located upon arrival at the auction and set aside for the taking of weights, doorway positions in the car were used whenever possible, and either one or two whole stacks were weighed. An entire lot was sometimes used, regardless of location in the car, because it would be set aside separately by the stevedores. Weighed packages of juice grapes billed for Kearney or Monmouth Street Yard delivery at Jersey City, N. J., had to be placed in the top layers near the doorway. Cars of juice-grapes are not unloaded before sale, hence it was necessary to remove the test packages, weigh, and replace them, for the car might be diverted to another destination after the sale. Another reason for the selection of top layer and doorway positions was that fruit in these portions of the load is most exposed to air circulation and therefore should shrink the most.



Maturity of the fruit:

A Balling saccharometer was used in 1934 to measure the soluble solids content of juice pressed from samples of the fruit from most of the lots. This can be considered as only a rough indication of the maturity of the fruit in the lot, but the results show that all lots were well within the limits of the state maturity standards.

Pre-shipment treatment of the fruit:

Most of the fruit was precooled with portable car-precooling apparatus after loading and bracing. Each car was also fumigated in some manner with sulphur dioxide. Most of the cars were loaded six rows wide, the lugs being stacked end to end from bulkhead to brace, but a few cars were loaded with the lugs placed crosswise, five lugs wide and twenty-six stacks long.

Refrigeration services utilized:

The cars used in the tests moved under various types of transit refrigeration, mostly under one of the modified icing services offered to fruit shippers.

The extent to which the service under which a shipment moved influenced the loss of weight of the commodity was not determined. The cars used in the tests were not selected because they were to be shipped under any specific icing service, but because the shippers who co-operated in this work were using these services regularly.

Origin and destination of cars:

All of the shipments, except the few from Lodi and Florin, originated in Central California and were billed to New York or



Baltimore, where it was convenient for packages to be reweighed. Market conditions, however, sometimes caused a car to be diverted to another destination at which the Bureau of Plant Industry did not maintain a representative. Whenever possible, the packages in these diverted cars were weighed by receiving point inspectors of the Bureau of Agricultural Economics. Most cars arrived on the market and were unloaded on the day scheduled, but several were held on track from 1 to 12 days.

#### RESULTS - 1933

The results of the 1933 tests with pertinent explanatory notes are shown in table 1. These tests were conducted with the last cars of fresh grapes to leave the Central California district. The fruit was mature and the weather cool at time of shipment. Losses in weight were low in all tests, only two lots showing shrinkage of 1 percent or more, both lots being Muscats held on track for an extended period. The tests included one lot of 72 kegs in which the loss averaged only slightly over 2 ounces per package, 4 packages actually gaining in weight. Such a gain, which is undoubtedly due to absorption of moisture in the iced car, might be expected when the packages and sawdust are very dry following the hot summer in the San Joaquin Valley.

#### RESULTS - 1934

The most striking feature of the 1934 results presented in table 2 is that the losses were consistently low. Of the 34 lots shipped, only two lost more than 2 percent of the original weight during the period between loading in California and unloading in the East. One of these lots was held on track for 7 days and when the car was opened only 10 of the 36 test lugs were unbroken, the rest having been smashed as a

Table 1. Weight losses from packages of vinifera grapes while in transit from Fresno, Calif., to eastern markets - 1933 season.

Variety	Date shipped	Days en-route on track	Pre-shipping treatment and method of loading	Refrigeration service	Number and kind of packages	Packed weights		Average lbs.-oz.	Range oz.	Loss in weight	
						lbs.-oz.	lbs.-oz.			Average oz.	Per-cent
Muscat	11/18	12	G, C	Rule 240	37 Sanger lugs	33	7 to 38 1	36 5	0-9	4.55	.80
Muscat	11/16	21	G, C	"	12 " "	35	8 to 38 4	36 7	*1-8	6.00	1.03
Muscat	11/20	18	S	Rule 254 with one reicing	46 Desert dis-play lugs	30	4 to 34 2	32 5	3-10	5.96	1.0
Emperor	11/18	12	G, C	Rule 240	204 Sanger lugs	32	7 to 40 7	34 14	0-12	4.24	.76
Emperor	11/20	10	P, S	Rule 254 with one reicing	40 Standard dis-play lugs	30	6 to 35 1	32 7	2-9	5.03	.97
Emperor	11/22	10	P, S	Rule 254	72 kegs	50	15 to 55 4	53 8	*2-5	2.14	.25
Malaga	11/20	10	P, S	Rule 254 with one reicing	40 Standard dis-play lugs	29	12 to 35 8	32 1	0-6	3.85	.75
Malaga	11/20	10	P, S	Rule 254 with one reicing	7 Standard dis-play lugs	30	15 to 33 0	32 3	4-7	5.0	.97
Malaga	11/22	11	P, S	Rule 254 with one reicing	9 Standard dis-play lugs	30	8 to 33 12	33 0	1-4	1.9	.36
Malaga	11/22	11	P, S	Rule 254 with one reicing	38 Standard dis-play lugs	30	12 to 35 3	32 1	0-4	2.0	.39
Malaga	11/23	11	P, S	Rule 254 with one reicing	88 Standard dis-play lugs	30	10 to 36 3	32 14	*1-15	3.05	.58
Malaga	11/23	11	P, S	Rule 254 with one reicing	8 Standard dis-play lugs	32	6 to 33 14	33 8	2-6	4.5	.84

1/ P - Precooled.

G - Gassed with sulphur dioxide.

S - Sulphur burned in car.

C - Crosswise load, all others lengthwise load.

\* - Indicates gain in weight.

2/ Rule 240 called for initial icing of bunkers by either shipper or carrier; no further icing. Rule 254 - Bunkers preiced and replenished by carrier at first icing station. No further re-icing unless specified by shipper.







Table 2. Weight losses from packages of vinifera grapes while in transit from California to eastern markets - 1934 season.

Variety	Date shipped	Days en- route and on track	Pre-shipping treatment and method of loading	Refrigeration service	Number and kind of packages	Balling of fruit degrees	Packed weights			Loss in weight	
							Range lbs.-oz.	Average lbs.-oz.	Range oz.	Average oz.	Per- cent
Red Malaga (Castize)	8/10	10	P, G	Rule 254 with one re-icing in transit	42 Special display lugs with cleats	21.6	31 15 to 37 6	34 4	2 12	9.0	1.64
"	8/11	10	P, G	"	41 Special display lugs with cleats		31 1 to 37 11	34 9	6 13	9.37	1.69
"	8/12	11	P, G	"	41 Special display lugs with cleats	19.1	31 15 to 36 12	34 13	4 12	6.76	1.21
White Malaga	8/10	10	P, G	"	42 Special display lugs with cleats	22.1	31 9 to 37 6	33 14	6 11	8.7	1.61
"	8/12	10	P, G	"	44 Special display lugs with cleats	22.0	32 2 to 36 15	34 8	5 14	8.69	1.57
"	8/13	10	P, G	"	40 Special display lugs with cleats	23.2	30 11 to 36 5	33 13	6 15	8.93	1.65
Ribier (Gros Guillaume)	8/11	10	P, G	"	41 Special display lugs with cleats	17.9	32 2 to 37 1	35 0	7 18	11.17	1.99
"	8/11	10	P, G	"	62 Special display lugs with cleats	17.9	31 14 to 37 2	34 6	4 13	8.32	1.51
Olivette Blanche	8/12	11	P, G	"	23 Special display lugs with cleats	19.2	29 12 to 34 7	31 9	0 10	3.83	.76
Cornichon	8/13	10	P, G	"	56 Special display lugs with cleats	19.2	30 9 to 35 10	32 12	3 14	6.71	1.28
"	8/13	10	P, G	"	42 Special display lugs with cleats	19.2	30 6 to 35 4	31 13	5 10	6.75	1.33
Alicante Bouschet	8/14	10	P, G	"	95 Sanger lugs	22.6	29 9 to 36 14	32 8	*4 16	4.36	.83
"	9/7	12	P, G	"	34 " "	22.4	28 4 to 31 13	30 4	5 11	7.47	1.54
"	10/30	16	G, C	Standard ref'n.	30 Los Angeles lugs with cleat	25.0	36 5 to 42 0	39 7	6 17	10.63	1.68
Thompson Seedless (Sultana)	8/27	14	P, G	"	95 Standard display lugs with cleat	22.9	30 2 to 34 12	32 8	4 12	8.01	1.54
"	8/28	14	P, G	"	94 Standard display lugs with cleat	22.9	30 2 to 34 9	32 7	4 14	9.35	1.80
"	8/30	11	P, S	Rule 254 with one re-icing in transit	94 Desert display lugs with cleat	22.5	29 7 to 34 6	31 8	4 10	6.84	1.36
"	8/31	11	P, S	"	57 Desert display lugs with cleat	23.4	30 4 to 33 6	31 11	3 11	7.54	1.48
"	8/31	11	P, S	"	35 Desert display lugs with cleat	22.6	30 8 to 33 11	31 14	4 13	7.57	1.48
"	8/27	11	P, G	Standard ref'n.	35 Standard display lugs with cleat	22.9	31 2 to 35 13	33 4	6 15	11.0	2.07
Tokay	9/7	12	P, G, C	Rule 254 with one re-icing in transit	57 Special display lugs	19.6	30 3 to 34 12	32 11	5 14	9.26	1.77
"	9/7	12	P, G, C	"	75 Standard display lugs	19.3	30 12 to 34 1	32 4	4 14	7.36	1.43
"	9/8	10	P, G	"	33 Standard display lugs	19.9	29 12 to 32 13	31 0	3 10	6.42	1.29
"	9/8	10	P, G	"	73 " "	19.9	31 3 to 35 8	33 6	4 11	6.84	1.28
"	9/8	10	P, G	"	77 " "	19.9	30 5 to 35 11	32 12	1 15	6.86	1.31
Zinfandel	9/9	11	P, G	Standard ref'n.	13 Sanger lugs	24.2	32 2 to 39 1	34 15	4 11	8.69	1.55
"	9/10	10	G, C	"	29 " "	24.2	31 4 to 35 3	33 5	6 11	7.21	1.35
"	9/11	13	G, C	Rule 254 with one re-icing in transit	16 Norman lugs with cleat	22.26	29 14 to 32 6	31 3	4 13	8.19	1.64
Muscate	9/28	10	P, G	"	10 " "	22.26	30 3 to 31 15	30 14	11 15	12.7	2.57
"	9/28	17	P, G	"	36 " "	22.26	29 11 to 33 4	31 5	7 13	9.53	1.90
"	9/29	16	P, G	"	48 " "	22.26	29 3 to 35 7	31 6	4 13	9.98	1.99
"	10/10	13	P, G	"	35 " "	22.26	30 2 to 33 3	31 12	5 12	8.86	1.77
"	10/10	10	P, G	"	10 No. 2 lugs with cleat		30 1 to 33 4	31 12	6 13	9.00	1.77
Carignane	10/30	16	G, C	Standard ref'n.	84 Special display lugs with cleat		31 5 to 37 0	34 7	6 14	9.26	1.70
Emperor	11/14	11	G	Rule 254							
Empty lugs	8/12	10	P, G	Rule 254 with one re-icing in transit	6 " "		4 0 to 4 6	-	*3 5	*3.3	*5.0

1/ P - Precooled.

G - Gassed with sulphur dioxide.

S - Sulphur burned in car.

C - Cresswise load, all others longwise load.

\* - Indicates gain in weight.

2/ Rule 254:- Pre-iced and replenished by

carrier at first icing station. No fur-

ther re-icing unless specified by shipper.

Standard refrigeration:- Bunches iced

initially and replenished to capacity by

carrier at all regular icing stations.

3/ Alicante Bouschet, Carignane,

Muscate, Zinfandel, and Tokay

packed without pads; other

varieties had some kind of

cushion in the bottom of the package.





result of excessive shifting of the load. It is possible that the jolting which broke such a large portion of the load might have thrown enough berries out through the slatted lids to make the average loss in this car the highest found. The packages having been weighed before loading in California and again in the East after being removed from the car, the losses recorded might include physical losses from pilferage and rough handling as well as physiological losses resulting from transpiration of moisture and respiration. The change in weight of the container was disregarded, though it probably gains weight due to the adsorption of moisture, as indicated in a test where several empty lugs were shipped in a carload of fruit, and gained an average of 3.3 ounces per package, or 5 percent.

Considering the average losses, 28 of the 34 lots lost between 6 to 10 ounces during the transit period, two lots averaged less than 6 ounces and four more than 10 ounces. Since there was a wide variation in average packed weights, the percentage of loss gives a more accurate picture. On the basis of the percentage of the original packed weight, two lots lost less than 1 percent, one lot less than 1.25 percent, while ten fell in the group losing between 1.25 percent and 1.5 percent. Twelve of the test lots lost more than 1.5 percent, but less than 1.75 percent; seven lots lost more than the latter figure, but less than 2 percent. Only two of the shipments had an average loss greater than 2 percent. Thirty lots, then, lost between 1 and 2 percent during the ten or more days elapsing between loading and sale.

At the beginning of the investigation it was thought likely that the losses in weight might be correlated with the variety. The results,

however, were quite variable within the variety and no classification of a variety as high-loss or low-loss can be made. Juice varieties did not differ markedly from table grapes in their susceptibility to moisture loss during the transit period.

Even among the small number of packages weighed in each car wide differences in weights were found. In general, field-packed fruit was most variable, and face-packed fruit least, with house-packed table grapes intermediate. The smallest variation within any lot was 1.75 pounds, which represented 5.8 percent of the average packed weight. Greatest variation existed in a lot of field-packed Alicante Bouschet which showed a maximum variation of 7 pounds and 5 ounces, or 19 percent of the average packed weight. These variations in the weights of individual packages within a small lot indicate that an erroneous estimate of the average weight of a lot might be made, if only a few lugs are considered. When the variation in packed weight is from 2 to 27 times the average loss in weight during transit extreme caution must be exercised in attributing differences found to shrinkage in transit unless a sufficient portion of the shipment has been weighed to minimize the importance of these differences.

#### SUMMARY

Losses of weight from standard packages of grapes occurring during loading, movement by rail from the West to the East Coast, and unloading were ascertained.

Very late shipments of lug-packed Muscat of Alexandria, Emperor, and Malaga in 1933 lost very little weight, the maximum loss for 21 days in transit being only 1.03 percent of the total weight when loaded.

Sawdust packages of grapes lost negligible amounts, some packages even gaining weight.

In shipping tests with the 12 varieties during the season of 1934, 30 lots out of 34 lost between 1 and 2 percent of their original packed weight while en route to eastern markets.

In determining the loss of weight of grapes in transit it is necessary to obtain the average of a relatively large number of packages because of the wide variation in weight which normally exists.

